

WHAT IS CLAIMED IS:

1. A speech coding method of selecting an excitation mode from a plurality of excitation modes, and encoding an input speech frame by frame with a predetermined length by using the excitation mode selected, said speech coding method comprising the steps of:

encoding in the respective excitation modes a target signal to be encoded that is obtained from the input speech, and outputting coding distortions involved in the encoding;

- 10 comparing at least one of the coding distortions involved in the encoding with one of three threshold values consisting of a fixed threshold value, a threshold value that is determined in response to signal power of the input speech and a threshold value that is determined in response to signal power of the target
- 15 signal to be encoded; and

selecting the excitation mode in response to the coding distortions involved in the encoding and a compared result at the step of comparing.

- 20 2. A speech coding method of selecting an excitation mode from a plurality of excitation modes, and encoding an input speech frame by frame with a predetermined length by using the excitation mode selected, said speech coding method comprising the steps of:

- 25 encoding in the respective excitation modes a target signal to be encoded that is obtained from the input speech, and outputting coding distortions involved in the encoding;

- selecting one of the excitation modes in response to a compared result obtained by comparing the coding distortions
- 30 involved in the encoding;

comparing the coding distortion corresponding to the excitation mode selected at the step of selecting with one of three threshold values consisting of a fixed threshold value, a threshold value that is determined in response to signal power of the input speech and a threshold value that is determined in response to signal power of the target signal to be encoded; and

replacing the excitation mode selected at the step of selecting, in response to a compared result obtained at the step of comparing.

3. The speech coding method according to claim 1, wherein the step of selecting suppresses selecting the excitation mode that gives a compared result that the coding distortion is greater than the threshold value.

4. The speech coding method according to claim 1, wherein the threshold value is prepared for each excitation mode.

5. The speech coding method according to claim 1, further comprising a step of converting the coding distortion by replacing it with the threshold value, when a compared result obtained at the step of comparing indicates that the coding distortion is greater than the threshold value, wherein

the step of selecting selects an excitation mode corresponding to a minimum coding distortion among the coding distortions of all the excitation modes including the coding distortion output at the step of replacing.

6. The speech coding method according to claim 2, wherein the

step of replacing selects a predetermined excitation mode when the coding distortion corresponding to the excitation mode selected at the step of selecting is greater than the threshold value.

5

7. The speech coding method according to claim 1, wherein the threshold value is set at a value constituting a predetermined distortion ratio to one of the input speech and the target signal to be encoded.

10

8. The speech coding method according to claim 1, further comprising the step of deciding an aspect of speech by analyzing at least one of the input speech and the target signal to be encoded, wherein

15

the step of selecting selects the excitation mode without using the compared result at the step of comparing, only when the step of deciding outputs a predetermined decision result.

20

9. The speech coding method according to claim 1, further comprising the steps of:

deciding an aspect of speech by analyzing at least one of the input speech and the target signal to be encoded; and

calculating a threshold value in response to a decision result at the step of deciding, wherein

25

the step of comparing carries out its comparison using the threshold value calculated at the step of calculating the threshold value.

30

10. The speech coding method according to claim 8, wherein the step of deciding makes a decision as to whether the aspect of

speech is onset of speech or not.

11. The speech coding method according to claim 1, wherein the plurality of excitation modes comprise an excitation mode that generates non-noisy excitation, and an excitation mode that generates noisy excitation.

12. The speech coding method according to claim 1, wherein the plurality of excitation modes comprise an excitation mode that uses non-noisy excitation codewords, and an excitation mode that uses noisy excitation codewords.

13. A speech coding apparatus that selects an excitation mode from a plurality of excitation modes, and encodes an input speech frame by frame with a predetermined length by using the excitation mode selected, said speech coding apparatus comprising:

coding units for encoding in the respective excitation modes a target signal to be encoded that is obtained from the input speech, and outputting coding distortions involved in the encoding;

a comparator for comparing at least one of the coding distortions involved in the encoding with one of three threshold values consisting of a fixed threshold value, a threshold value that is determined in response to signal power of the input speech and a threshold value that is determined in response to signal power of the target signal to be encoded; and

a selecting unit for selecting the excitation mode in response to the coding distortions involved in the encoding by said coding units and a compared result of said comparator.

14. A speech coding apparatus for selecting an excitation mode from a plurality of excitation modes, and encoding an input speech frame by frame with a predetermined length by using the excitation mode selected, said speech coding apparatus comprising:

5 coding units for encoding in the respective excitation modes a target signal to be encoded that is obtained from the input speech, and outputting coding distortions involved in the encoding;

10 a selecting unit for comparing the coding distortions involved in the encoding by said coding units, and for selecting one of the excitation modes in response to a compared result obtained;

15 a comparator for comparing the coding distortion corresponding to the excitation mode selected by said selecting unit with one of three threshold values consisting of a fixed threshold value, a threshold value that is determined in response to signal power of the input speech and a threshold value that is determined in response to signal power of the target signal to be encoded; and

20 a substituting unit for replacing the excitation mode selected by said selecting unit, in response to a compared result of said comparator.

25 15. The speech coding apparatus according to claim 13, wherein said comparator sets its threshold value to be compared with the coding distortion, at a value constituting a predetermined distortion ratio to one of the input speech and the target signal to be encoded.

30 16. The speech coding apparatus according to claim 13, further

comprising a deciding unit for deciding an aspect of speech by analyzing at least one of the input speech and the target signal to be encoded, wherein

5 said selecting unit selects the excitation mode without using the compared result of said comparator, only when said deciding unit outputs a predetermined decision result.

10 17. The speech coding apparatus according to claim 13, wherein the plurality of excitation modes comprise an excitation mode that generates non-noisy excitation, and an excitation mode that generates noisy excitation.